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Prepared in cooperation with the U.S. Geological Survey

GEOLOGIC MAP OF THE PALA 7.5' QUADRANGLE SAN DIEGO COUNTY, CALIFORNIA: A DIGITAL DATABASE

VERSION 1.0

By
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Digital Database
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2000

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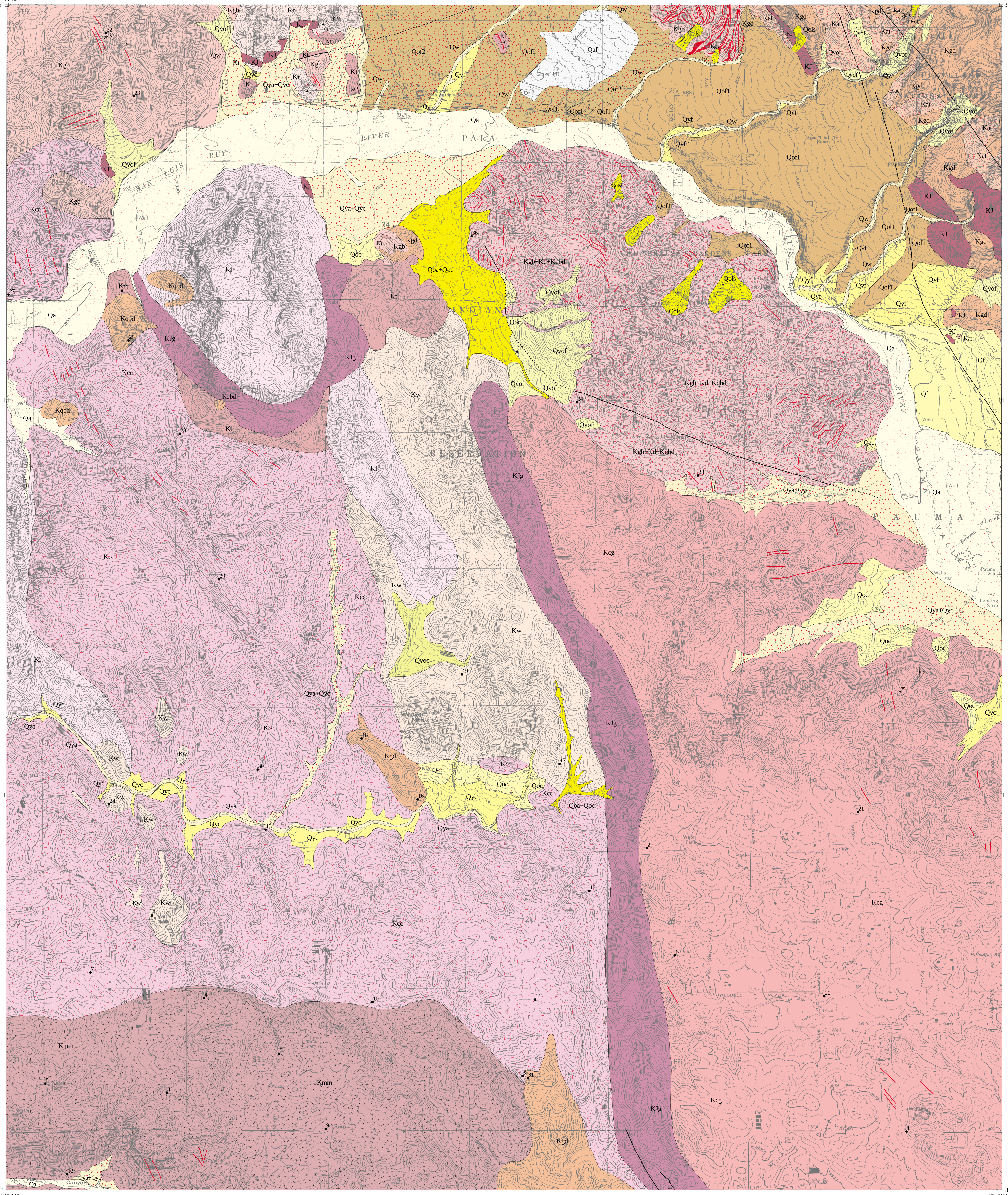
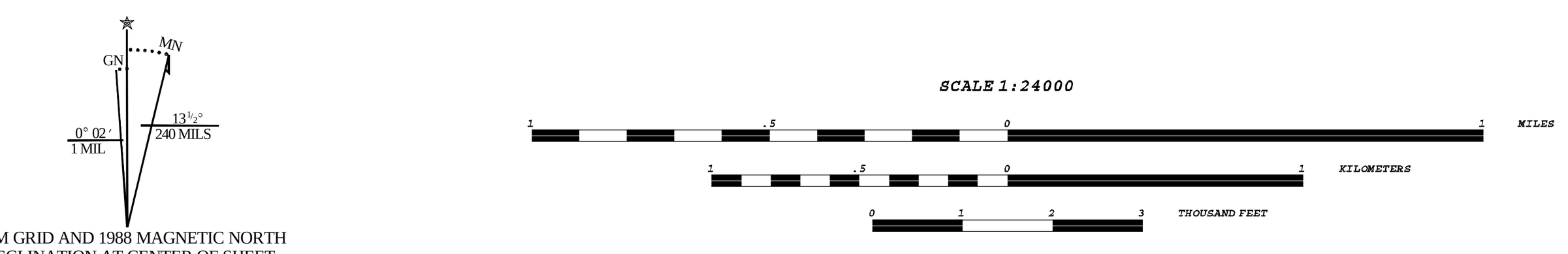
DEPARTMENT OF CONSERVATION
Division of
Mines and Geology



Topographic base by U.S. Geological Survey
7.5' Pala Quadrangle
Polyconic projection, contour interval 20 feet,
dotted lines 10 feet.



UTM GRID AND 1988 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

This geologic map was funded in part by the U.S. Geological Survey National Cooperative Geologic Mapping Program, STATEMAP Award no. 99HQAG0134.

CORRELATION OF MAP UNITS

Qaf	Qw	Qf	Qa			Holocene
		Qyf	Qya	Qyc		
		Qof2 / Qof1	Qoa	Qoc	Qols	Pleistocene
		Qvof		Qvoc		

Holocene, Pleistocene — QUATERNARY — CENOZOIC

Kr, Kmm, Kat, Kcg, Kcc, Ki, Kw, Kgd, Kd, Kt, Kqbd, Kgb, KJg, KJ — CRETACEOUS, JURASSIC — MESOZOIC

DESCRIPTION OF MAP UNITS

MODERN SURFICIAL DEPOSITS - Sediment that has been recently transported and deposited in channels and washes, on surfaces of alluvial fans and alluvial plains, and on hillslopes and in artificial fills. Soil-profile development is non-existant. Includes:

- **Qaf** — Man made "artificial cut and fill".
- **Qw** — Active channel and wash deposits (late Holocene) - Unconsolidated to locally poorly consolidated sand and gravel deposits in active washes of streams.
- **Qf** — Active alluvial fan deposits (late Holocene) - Unconsolidated to locally poorly consolidated sand, gravel, cobble and boulder deposits in active alluvial fans.
- **Qa** — Active alluvial flood plain deposits (late Holocene) - Unconsolidated to locally poorly consolidated sand and gravel deposits in active alluvial flood plains.

YOUNG SURFICIAL DEPOSITS - Sedimentary units that are slightly consolidated to cemented and slightly to moderately dissected. Alluvial fan deposits typically have high coarse:fine clast ratios. Younger surficial units have upper surfaces that are capped by slight to moderately developed soil profiles. Includes:

- **Qya** — Young alluvial flood plain deposits (Holocene and late Pleistocene) - Mostly unconsolidated, poorly sorted, permeable flood plain sediment.
- **Qyc** — Young colluvial deposits (Holocene and late Pleistocene) - Mostly poorly consolidated and poorly sorted slope wash and stream deposits.
- **Qyf** — Young alluvial fan deposits (Holocene and late Pleistocene) - Mostly poorly consolidated and very poorly sorted sand, gravel, cobble and boulder deposits in young alluvial fans.

OLD SURFICIAL DEPOSITS - Sedimentary units that are moderately consolidated and slightly to moderately well dissected. Older surficial deposits have upper surfaces that are capped by moderately to well-developed soils. Includes:

- **Qoa** — Older alluvial flood plain deposits (Pleistocene, younger than 500,000 years) - Mostly moderately well consolidated, poorly sorted, permeable flood plain deposits.
- **Qoc** — Older colluvial deposits (Pleistocene, younger than 500,000 years) - Mostly moderately well consolidated, poorly sorted slope wash and stream deposits.
- **Qof2** — Older fan deposits (Pleistocene, younger than 500,000 years) - Mostly poorly consolidated fan, debris flow and talus deposits. Clasts possess a moderately well developed clay coating but are otherwise fresh.
- **Qof1** — Older fan deposits (Pleistocene, younger than 500,000 years but older than Qof2 deposits) - Mostly poorly consolidated fan, debris flow and talus deposits. Clasts are distinctly deeply weathered and the matrix distinctly reddish brown in color.
- **Qols** — Older landslide deposits (Holocene to Pleistocene) - Landslide slump and rock fall deposits.

VERY OLD SURFICIAL DEPOSITS - Sediments that are slightly to well consolidated to indurated, and moderately to well dissected. Upper surfaces are capped by moderate to well developed pedogenic soils. Includes:

- **Qvoc** — Very old colluvial deposits (early Pleistocene) - Mostly well-indurated, clay and sand deposits that mantle early Pleistocene uplifted depressions.
- **Qvof** — Very old alluvial fan deposits (early Pleistocene) - Mostly very well-indurated, reddish-brown, sand and cobble, early Pleistocene alluvial fan deposits.

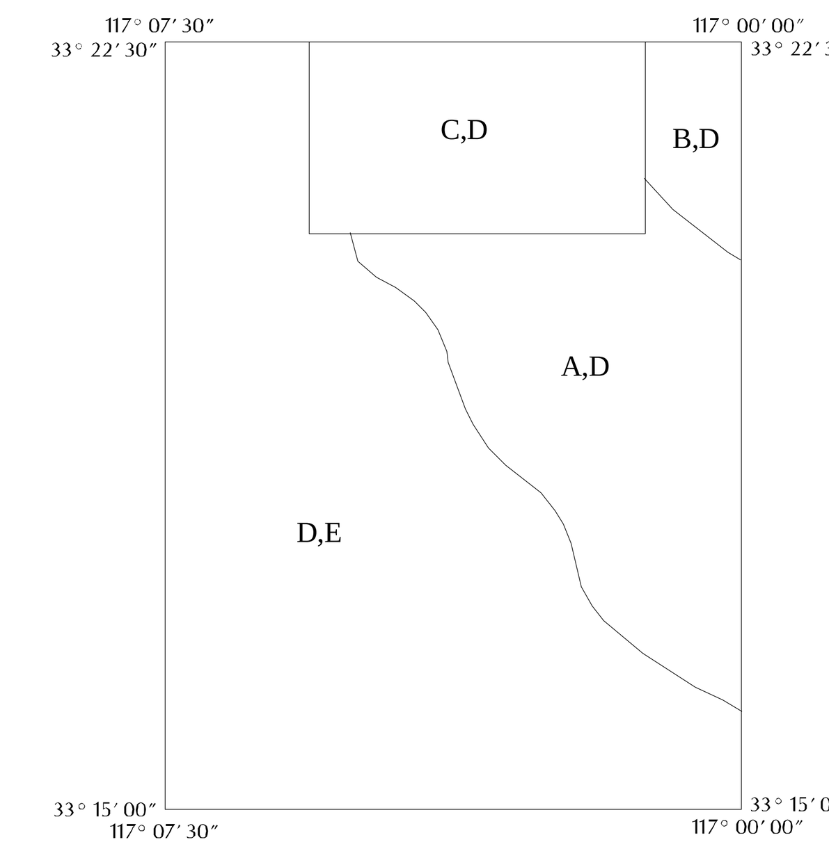
BEDROCK UNITS

- **Kr** — Granodiorite of Rainbow (Cretaceous) - Leucocratic hornblende-biotite granodiorite; medium to coarse grained, massive.
- **Kmm** — Monzogranite of Merriam Mountain (Cretaceous) - Leucocratic hornblende-biotite monzogranite; medium to coarse grained, massive.
- **Kat** — Gabbro of the Agua Tibia Mountains (Cretaceous) - Hornblende gabbro; medium to coarse grained, massive to foliate. This gabbro often contains minor biotite and quartz (quartz bearing gabbro).
- **Kcg** — Tonalite of Cole Grade (Cretaceous) - Hornblende-biotite tonalite; coarse grained and massive.
- **Kcc** — Tonalite of Couser Canyon (Cretaceous) - Hornblende-biotite tonalite; coarse grained and massive. Contains some granodiorite and is characterized by an abundance of pegmatitic dikes.
- **Ki** — Granodiorite of Indian Mountain (Cretaceous) - Biotite leucocratic granodiorite; white, fine to medium grained and massive.
- **Kw** — Gabbro of Weaver Mountain (Cretaceous) - Hornblende gabbro; coarse grained and massive.
- **Kgd** — Granodiorite undivided (Cretaceous) - Mostly hornblende-biotite granodiorite; coarse to medium grained.
- **Kd** — Diorite undivided (Cretaceous) - Mostly hornblende diorite; medium to coarse grained, dark gray, massive.
- **Kt** — Tonalite undivided (Cretaceous) - Mostly hornblende-biotite tonalite; coarse grained, light gray.
- **Kqbd** — Quartz bearing diorite undivided (Cretaceous) - Mostly biotite-hornblende quartz bearing diorite; medium grained, dark gray, massive.
- **Kgb** — Gabbro undivided (Cretaceous) - Mostly biotite-hornblende-hypersthene gabbro; coarse grained, dark gray, massive.
- **KJg** — Metagranitic rocks (Cretaceous and Jurassic) - Mostly gneiss; very light gray to white, massive.
- **KJ** — Metavolcanic and metasedimentary rocks undivided (Cretaceous and Jurassic) - Low grade (greenschist facies) rocks that are in part coeval with and in part older than the Cretaceous plutonic rocks they lie in contact with.

MAP SYMBOLS

- Contact between map units.
- Fault - dashed where inferred, dotted where concealed.
- 18 — Strike and dip of foliation.
- Landslide - arrows indicate principal direction of movement.
- Air photo lineament - Mostly joints and minor folds.
- Pegmatite dike.
- 36 — Location of samples collected for thin section analysis

REFERENCES



A. Hanley, J.B. and Jahns, R.H., 1950, unpublished geological maps of the Pala and Rincon pegmatite districts, San Diego County California: Unpublished U.S. Geological Survey mapping (scale 1:24,000). This mapping was used with slight modification for the basement rock geology in the north- and east-central part of the quadrangle.

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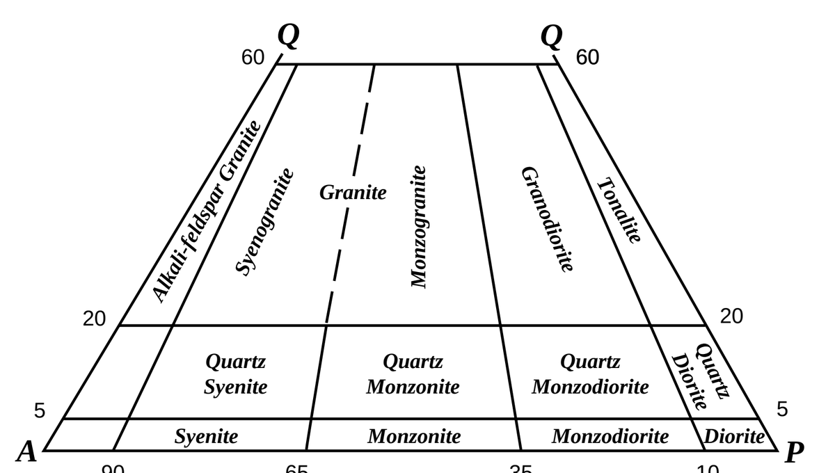

Classification of plutonic rock types (from IUGA, 1973, and *Streckeisen, 1973).
A, alkali feldspar; P, plagioclase feldspar; Q, quartz.

*Streckeisen, A.L., 1973, Plutonic rocks--Classification and nomenclature recommended by the IUGA Subcommission on Systematics of Igneous Rocks: Geotimes, vol.18, pp.26-30.